PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-250389
(43)Date of publication of application : 27.09.1996

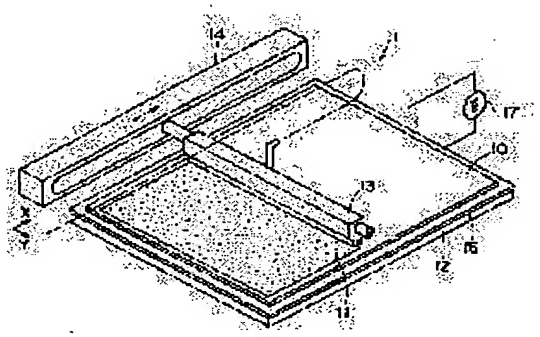
(51)Int.Cl. H01L 21/027
B05C 11/06
G03F 7/16

(21)Application number : 07-048459
(22)Date of filing : 08.03.1995

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD
(72)Inventor : NAKA HIROYUKI
MIURA MASAYOSHI

(54) THIN FILM FORMING DEVICE AND THIN FILM FORMING METHOD

(57)Abstract:
PURPOSE: To suppress wasteful consumption of applying liquid and make a film thickness after applied as uniformly as possible by a simple moving control even if there is a bending or a rugged portion on a substrate.
CONSTITUTION: An ink jet cotar 1 is a device for forming a thin film of resist liquid on an annular substrate 10, and comprises a substrate holding part 12 for holding a substrate; and an ink jet head 13 having a plural ink jet nozzle of an ink jet method arranged to the Y direction, for spraying resist liquid from a plural nozzle to the annular substrate 10 to apply the resist liquid on the annular substrate 10; and a head moving part 14 for moving linearly the ink jet head 13 for the substrate holding part 12 to the X direction. The resist liquid is indirectly sprayed by a constant amount, while the ink jet head 13 is directly moved on the annular substrate 10 to form a resist film 11 of a uniform film thickness.



LEGAL STATUS

[Date of request for examination]	08.02.2000
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3284814
[Date of registration]	08.03.2002
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's	

decision of rejection]
[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] A substrate maintenance means to be the thin film deposition system which forms the thin film of coating liquid on a substrate, and to hold said substrate, A coating liquid spreading means to have two or more nozzles of the ink jet method put in order and arranged in the 1st direction, to blow off said coating liquid from said two or more nozzles towards said substrate, and to apply said coating liquid on said substrate, The thin film deposition system equipped with a relative-displacement means to make said coating liquid spreading means linearly displaced relatively to said substrate maintenance means in said 1st direction and the 2nd crossing direction.

[Claim 2] A substrate maintenance means to be the thin film deposition system which forms the thin film of coating liquid on a substrate, and to hold said substrate, The elastic roll which can roll freely the substrate top held at said substrate maintenance means, and the mold release layer means forming which forms a mold release layer in the peripheral surface of said elastic roll, It has two or more nozzles of the ink jet method put in order and arranged in the 1st direction. A coating liquid spreading means to blow off said coating liquid from said two or more nozzles towards the peripheral surface of said elastic roll with which the mold release layer was formed, and to apply said coating liquid to the peripheral surface of said elastic roll by said mold release layer means forming, The thin film deposition system equipped with a relative-displacement means to imprint the coating liquid which you made it roll, pressing the elastic roll with which said coating liquid was applied to said substrate, made it linearly displaced relatively in said 1st direction and the 2nd crossing direction to said substrate maintenance means, and was applied to said elastic roll to said substrate.

[Claim 3] Said coating liquid is a thin film deposition system according to claim 1 or 2 which has a dielectric and is further equipped with a 1st electrification means to electrify the substrate held at said substrate maintenance means in the 1st polarity,

and a 2nd electrification means to electrify the coating liquid which blows off from said each nozzle in said 1st polarity and 2nd polarity of reversed polarity.

[Claim 4] A thin film deposition system given in either of claims 1-3 which is further equipped with a coating liquid supply means to supply the coating liquid positive-pressure-ized by said coating liquid spreading means.

[Claim 5] A thin film deposition system given in either of claims 1-4 which is further equipped with the nozzle control means which controls jet/cutoff of the coating liquid in said each nozzle, respectively.

[Claim 6] The substrate maintenance process of being the thin film formation approach which forms the thin film of coating liquid on a substrate, and holding said substrate to a substrate attaching part, Two or more nozzles of the ink jet method put in order and arranged in the 1st direction The thin film formation approach including the coating liquid spreading process which blows off said coating liquid from said two or more nozzles towards said substrate, and applies said coating liquid on said substrate, making it linearly displaced relatively in said 1st direction and the 2nd crossing direction to said substrate attaching part.

[Claim 7] The substrate maintenance process of being the thin film formation approach which forms the thin film of coating liquid on a substrate, and holding said substrate to a substrate attaching part, The mold release layer formation process which forms a mold release layer in the peripheral surface of the elastic roll which can roll freely the substrate top held at said substrate maintenance process, The coating liquid spreading process which blows off coating liquid from two or more nozzles of the ink jet method put in order and arranged in the 1st direction towards the mold release layer formed in the peripheral surface of an elastic roll with said mold release layer formation process, and applies said coating liquid on said elastic roll, You roll it, pressing the elastic roll with which coating liquid was applied at said coating liquid spreading process to said substrate, and make it linearly displaced relatively in said 1st direction and the 2nd crossing direction to said substrate attaching part. The thin film formation approach including the coating liquid imprint process which imprints the coating liquid applied to said elastic roll to said substrate.

[Claim 8] Said coating liquid spreading process is the thin film formation approach according to claim 6 or 7 which includes further the 2nd electrification process which electrifies the coating liquid which blows off from said each nozzle in said 1st polarity and 2nd polarity of reversed polarity, including further the 1st electrification process which said coating liquid is [process] a dielectric and electrifies the substrate with which said substrate maintenance process was held at said substrate attaching part in

the 1st polarity.

[Claim 9] The thin film formation approach given in either of claims 6-8 which controls the jet/cutoff in said each nozzle by said coating liquid spreading process, respectively to become a predetermined spreading pattern.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the thin film deposition system and the thin film formation approach of forming the thin film of coating liquid, such as a resist and liquid crystal, on a substrate.

[0002]

[Description of the Prior Art] Conventionally, the thin film formation approaches, such as a spin coat method, the die coat method, and the roll coat method, are learned as an approach of forming a thin film in a semi-conductor substrate, the substrate for liquid crystal displays, or the substrate for color filters. A spin coat method is an approach of carrying out high-speed rotation of the substrate, and making a substrate front face diffusing coating liquid in homogeneity according to a centrifugal force, after trickling coating liquid into the core of the substrate held on the spin chuck as generally known well. The die coat method is the approach of making a nozzle displaced relatively in the formation direction of a slit, and the direction which intersects perpendicularly, and applying coating liquid to it to the substrate held horizontally, flowing coating liquid out of a slit-like nozzle as indicated by JP,56-159646,A. At this time, thickness after applying is made into homogeneity by moving a nozzle, pressing down coating liquid on the inferior surface of tongue of a nozzle. The roll coat method is the approach of imprinting coating liquid on a substrate front face because coating liquid is applied to the front face of the roll which rolls contacting a substrate as indicated by JP,4-99266,U, and you roll a roll and make it displaced relatively to a substrate.

[0003]

[Problem(s) to be Solved by the Invention] In said spin coat method, since coating liquid is diffused in high-speed rotation, even if the substrate has curved or it is irregular on the surface of a substrate, coating liquid can be diffused in homogeneity, and the

thickness after spreading tends to become homogeneity. However, since 80 - 90% of the dropped coating liquid disperses from a substrate front face, there is a problem that coating liquid is consumed vainly.

[0004] By the die coat method, since a nozzle is moved to a substrate and coating liquid can be applied only on a substrate, compared with a spin coat method, coating liquid is not consumed vainly. However, film pressure does not become homogeneity, although the front face of coating liquid will become smooth if the substrate has curved or irregularity is on a substrate since coating liquid is pressed down on the inferior surface of tongue of a nozzle and he is trying for thickness to become homogeneity. Therefore, when curvature and irregularity are in a substrate, there is a problem that thickness does not become homogeneity unless it moves a nozzle along with curvature or irregularity, but migration control of a nozzle becomes complicated.

[0005] By the roll coat method, since a roll is moved to a substrate and coating liquid is imprinted to the substrate, coating liquid is hard to be consumed vainly like the die coat method. However, when measuring precision is difficult and curvature and irregularity are in a substrate since coating liquid separates into the both sides of roll material and a substrate even if it applies coating liquid to a roll at homogeneity, there is a problem that the thickness of the spreading film imprinted by the substrate does not become homogeneity.

[0006] Even if this invention solves the technical problem of the above-mentioned conventional technique, and the purpose holds down useless consumption of coating liquid and curvature and irregularity are in a substrate, it is in offering the thin film deposition system and the thin film formation approach as for which thickness after spreading is made to homogeneity as much as possible in easy migration control.

[0007]

[Means for Solving the Problem] A substrate maintenance means for the thin film deposition system concerning claim 1 to be equipment which forms the thin film of coating liquid on a substrate, and to hold a substrate, A coating liquid spreading means to have two or more nozzles of the ink jet method put in order and arranged in the 1st direction, to blow off coating liquid from two or more nozzles towards a substrate, and to apply coating liquid on a substrate, It has a relative-displacement means to make a coating liquid spreading means linearly displaced relatively to a substrate maintenance means in the 1st direction and the 2nd crossing direction.

[0008] The elastic roll with which the thin film deposition system concerning claim 2 can roll freely the substrate top held at a substrate maintenance means to hold a substrate, and the substrate maintenance means, It has two or more nozzles of the mold

release layer means forming which forms a mold release layer in the peripheral surface of an elastic roll, and the ink jet method put in order and arranged in the 1st direction. A coating liquid spreading means to blow off coating liquid from two or more nozzles towards the peripheral surface of the elastic roll with which the mold release layer was formed, and to apply coating liquid to the peripheral surface of an elastic roll by mold release layer means forming, You made it roll, pressing to a substrate the elastic roll with which coating liquid was applied, and made it linearly displaced relatively in the 1st direction and the 2nd crossing direction to a substrate maintenance means, and it has a relative-displacement means to imprint to a substrate the coating liquid applied to the elastic roll.

[0009] In equipment according to claim 1 or 2, coating liquid had the dielectric and the thin film deposition system concerning claim 3 is further equipped with a 1st electrification means to electrify the substrate held at the substrate maintenance means in the 1st polarity, and a 2nd electrification means to electrify the coating liquid which blows off from each nozzle in the 1st polarity and the 2nd polarity of reversed polarity. The thin film deposition system concerning claim 4 is further equipped with a coating liquid supply means to supply the coating liquid positive-pressure-ized by the coating liquid spreading means in equipment given in either of claims 1-3.

[0010] The thin film deposition system concerning claim 5 equips either of claims 1-4 with the nozzle control means which controls jet/cutoff of the coating liquid in each nozzle, respectively further in the equipment of a publication. The substrate maintenance process of the thin film formation approach concerning claim 6 being the approach of forming the thin film of coating liquid on a substrate, and holding a substrate to a substrate attaching part, The coating liquid spreading process which blows off coating liquid from two or more nozzles towards a substrate, and applies coating liquid on a substrate is included making two or more nozzles of the ink jet method put in order and arranged in the 1st direction linearly displaced relatively to a substrate attaching part in said 1st direction and the 2nd crossing direction.

[0011] The substrate maintenance process that the thin film formation approach concerning claim 7 holds a substrate to a substrate attaching part, The mold release layer formation process which forms a mold release layer in the peripheral surface of the elastic roll which can roll freely the substrate top held at the substrate maintenance process, The coating liquid spreading process which blows off coating liquid from two or more nozzles of the ink jet method put in order and arranged in the 1st direction towards the mold release layer formed in the peripheral surface of an elastic roll with a mold release layer formation process, and applies coating liquid on an elastic roll, You

roll it, pressing to a substrate the elastic roll with which coating liquid was applied at the coating liquid spreading process, make it linearly displaced relatively in the 1st direction and the 2nd crossing direction to a substrate attaching part, and the coating liquid imprint process which imprints to a substrate the coating liquid applied to the elastic roll is included.

[0012] In an approach according to claim 6 or 7, the coating liquid of the thin film formation approach concerning claim 8 is a dielectric, and the coating liquid spreading process includes further the 2nd electrification process which electrifies the coating liquid which blows off from each nozzle in the 1st polarity and the 2nd polarity of reversed polarity, including further the 1st electrification process which electrifies the substrate with which the substrate maintenance process was held at the substrate attaching part in the 1st polarity.

[0013] The thin film formation approach concerning claim 9 controls the jet/cutoff in each nozzle by the coating liquid spreading process in an approach given in either of claims 6-8, respectively to become a predetermined spreading pattern.

[0014]

[Function] In the thin film deposition system concerning claim 1, making a processing liquid spreading means linearly displaced relatively in the 2nd direction to the substrate held at the substrate maintenance means, quantum jet of the coating liquid is intermittently carried out from the location left on the substrate with each nozzle of an ink jet method, and coating liquid is applied on a substrate. Here, since the nozzle of an ink jet method is used, coating liquid can be applied to homogeneity on a substrate only by making a nozzle linearly displaced relatively, without carrying out constant feeding intermittently towards a substrate from the location where the coating liquid which blew off from the nozzle separated from the substrate, and pressing down coating liquid. For this reason, even if curvature and irregularity are in a substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0015] In the thin film deposition system concerning invention of claim 2, after a mold release layer is formed in the peripheral surface of an elastic roll, coating liquid blows off from two or more nozzles of an ink jet method towards the peripheral surface of the elastic roll with which the mold release layer was formed, and coating liquid is applied to the peripheral surface of an elastic roll. And it rolls the elastic roll with which coating liquid was applied being pressed by the substrate, and is linearly displaced relatively in the 2nd direction to a substrate maintenance means, and the coating liquid applied to the elastic roll is imprinted by the substrate. Here, since the nozzle of an ink jet method

is used, while constant feeding is carried out towards an elastic roll from the location where the coating liquid which blew off from the nozzle separated from the elastic roll and being able to apply coating liquid to homogeneity at an elastic roll, a roll surface moves along with the curvature and irregularity of a substrate only by making an elastic roll linearly displaced relatively to a substrate with the elasticity of an elastic roll. For this reason, even if curvature and irregularity are in a substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control. Moreover, there is no back ****** to a roll side by removing a mold release tub later (there being desiccation).

[0016] In the thin film deposition system concerning invention of claim 3, in case the coating liquid which has a dielectric blows off from a nozzle, it is charged in the 2nd polarity with the 2nd electrification means, and is applied to a substrate and an elastic roll. On the other hand, a substrate is charged in the 1st polarity with the 1st electrification means. For this reason, when coating liquid is applied or imprinted by the substrate, the polarity of coating liquid and a substrate becomes reverse, attraction occurs between a substrate and coating liquid, the coating liquid on a substrate is graduated, and thickness becomes homogeneity more.

[0017] In the thin film deposition system concerning invention of claim 4, since the coating liquid positive-pressure-ized by the coating liquid spreading means is supplied, constant feeding of the coating liquid which blows off from a nozzle is carried out more. In the thin film deposition system concerning invention of claim 5, since jet/cutoff of the coating liquid in each nozzle are controlled by the nozzle control means, respectively, coating liquid can be applied by the desired pattern on a substrate or an elastic roll, and consumption of coating liquid can be held down more.

[0018] By the thin film formation approach concerning invention of claim 6, if a substrate is held to a substrate attaching part, making two or more nozzles of an ink jet method linearly displaced relatively to a substrate attaching part in said 1st direction and the 2nd crossing direction, coating liquid will be blown off from two or more nozzles towards a substrate, and coating liquid will be applied on a substrate. Here, since the nozzle of an ink jet method is used, coating liquid can be applied to homogeneity on a substrate only by making a nozzle linearly displaced relatively, without carrying out constant feeding intermittently towards a substrate from the location where the coating liquid which blew off from the nozzle separated from the substrate, and pressing down coating liquid. For this reason, even if curvature and irregularity are in a substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0019] By the thin film formation approach concerning invention of claim 7, if a substrate is held to a substrate attaching part, a mold release layer will be formed in the peripheral surface of an elastic roll, it will blow off from two or more nozzles of an ink jet method towards the mold release layer by which coating liquid was formed in the peripheral surface of an elastic roll, and coating liquid will be applied on an elastic roll. And you roll it, pressing to a substrate the elastic roll with which coating liquid was applied, make it linearly displaced relatively to a substrate attaching part, and the coating liquid applied to the elastic roll is imprinted to a substrate. Here, since the nozzle of an ink jet method is used, while constant feeding is carried out towards an elastic roll from the location where the coating liquid which blew off from the nozzle separated from the elastic roll and being able to apply coating liquid to homogeneity at an elastic roll, a roll surface moves along with the curvature and irregularity of a substrate only by making an elastic roll linearly displaced relatively to a substrate with the elasticity of an elastic roll. For this reason, even if curvature and irregularity are in a substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control of a roll.

[0020] By the thin film formation approach concerning invention of claim 8, in case the coating liquid which has a dielectric blows off from a nozzle, it is charged in the 2nd polarity and applied to a substrate and an elastic roll. On the other hand, a substrate is charged in the 1st polarity. For this reason, when coating liquid is applied or imprinted by the substrate, the polarity of coating liquid and a substrate becomes reverse, attraction occurs between a substrate and coating liquid, the coating liquid on a substrate is graduated, and thickness becomes homogeneity more.

[0021] By the thin film formation approach concerning invention of claim 9, since jet/cutoff of the coating liquid in each nozzle are controlled, respectively, coating liquid can be applied by the desired pattern on a substrate or an elastic roll, and consumption of coating liquid can be held down more.

[0022]

[Example]

Example 1 drawing 1 is the perspective view showing the configuration of the ink jet coater as a thin film deposition system by one example of this invention. In drawing 1, the ink jet coater 1 applies dielectric resist liquid to the square shape substrate 10 for liquid crystal displays, and forms the resist film 11. The ink jet coater 1 is equipped with the substrate attaching part 12 holding the square shape substrate 10, the ink jet head 13 which moves in the direction of X (longitudinal direction of the square shape substrate 10) in the substrate attaching part 12 top, and the head migration section 14

which moves the ink jet head 13 in the direction of X. The substrate attaching part 12 has a little bigger area than the square shape substrate 10, and has structure which carries out vacuum adsorption of the square shape substrate 10. The substrate attaching part 12 has the electrode plate 16 on the front face. The electrode plate 16 is for giving negative charge to the square shape substrate 10, and is connected to the power source 17.

[0023] The ink jet head 13 has the ink jet nozzle 20 of a large number installed in the direction of Y which intersects perpendicularly with the direction of X by separating spacing, as shown in drawing 2 . The ink jet nozzle 20 is a diameter of 0.1mm, and spouts resist liquid intermittently. Moreover, the ink jet nozzle 20 is arranged so that the square shape substrate 10 and spacing may be separated and it may move. The ink jet nozzle 20 has the liquid storage space 21 formed in the ink jet head 13, and the piezo-electric element 22 prepared above the liquid storage space 21 corresponding to each ink jet nozzle 20. A piezo-electric element 22 is a piezoelectric device which vibrates according to the impressed electrical potential difference, and the supply control section 23 for controlling a piezo-electric element 22 is connected there. The liquid reservoir 24 is connected to the liquid reservoir 21. The liquid reservoir 24 is the tank of a direct vent system, the source 25 of air supply is connected there, and the positive pressure air whose pressure was regulated from the source 25 of air supply is supplied to it. The PURICHA jar 30 is arranged under the ink jet nozzle 20. The PURICHA jar 30 is for giving positive charge to the resist liquid spouted from the ink jet nozzle 20.

[0024] With this ink jet head 13, the resist liquid pressurized by the source 25 of air supply is supplied to the liquid reservoir space 21 from the liquid reservoir 24. Consequently, the resist liquid in the ink room 21 is stored in the liquid reservoir room space 21 in the condition of not spouting caudad, although pressurization is carried out to the predetermined pressure. And if a slight vibration is added by the piezo-electric element 22, resist liquid will be caudad spouted from the ink jet nozzle 20.

[0025] Next, actuation of an above-mentioned example is explained. The square shape substrate 10 is first laid on the substrate attaching part 12, and vacuum adsorption is carried out. Then, it energizes to the electrode plate 16 according to a power source 17, and the square shape substrate 10 is charged in negative charge. By the head migration section 14, the ink jet head 13 is moved in the direction of X from the edge of the drawing 1 near side of the square shape substrate 10 in this condition. The resist liquid which the piezo-electric element 22 was controlled by the supply control section 23, and the piezo-electric element was vibrated, and was supplied from the liquid reservoir 24

with it is spouted intermittently caudad. At this time, the resist liquid which blew off from the ink jet nozzle 20 is charged in positive charge with the PURICHA jar 30. Consequently, if the resist liquid which blew off from the ink jet nozzle 20 blows off intermittently to the square shape substrate 10, since the square shape substrate 10 is charged in negative, resist liquid is applied flat and smooth by the square shape substrate 10 top by electric attraction, and the resist film 11 of uniform thickness can be formed on the square shape substrate 10 along a substrate side.

[0026] If the ink jet head 13 moves to the edge by the side of the back of the square shape substrate 10, vibration of a piezo-electric element 22 will be suspended by the supply control section 23, and jet of resist liquid will be stopped. At this time, supply of the air from the source 25 of air supply is also suspended, and supply of resist liquid is intercepted completely. And the ink jet head 13 is returned to the edge of a near side. Here, since resist liquid is intermittently blown off from the ink jet nozzle 20 and he is trying to supply the resist liquid of a constant rate to the square shape substrate 10, also when the square shape substrate 10 has curved, or another film is already formed on the square shape substrate 10 and it is irregular, the resist film 11 of uniform thickness can be formed.

[Modification] The supply control section 23 performs on-off control of a piezo-electric element 22, and you may make it form resist film 11a of a predetermined detailed pattern, as shown in drawing 3 . By using the ink jet head 13, formation of such a detailed pattern can also be performed easily. Here, resist film 11a of a detailed pattern can be formed only in the required field on the square shape substrate 10 by turning a piezo-electric element 22 on and off, and carrying out jet/cutoff control of the ink jet nozzle 20. In this case, useless consumption of the resist film can be held down further.

Example 2 drawing 4 is the perspective view showing the configuration of the ink jet coater of the roll type by the example 2.

[0027] The ink jet coater 1 has the flexible roll 31 which rolls the substrate attaching part [holding the square shape substrate 10] 12, and substrate attaching part 12 top, and moves in the direction of X, and the roll migration section 32 which moves the flexible roll 31 in the direction of X. In the peripheral surface of the flexible roll 31, two ink jet heads 33 and 34 separate spacing, and are arranged in the hoop direction at it. The ink jet head 33 is arranged at the improvement style side in the method of rotation of the ink jet head 34.

[0028] It is the roll which has the elasticity with which the elastic body 35 was stuck on the front face, and the flexible roll 31 is learned from the curvature and irregularity of the square shape substrate 10, and is movable. The ink jet head 33 applies mold release

liquid to the front face of the flexible roll 31, as shown in drawing 5 . The ink jet head 34 applies resist liquid to the front face of the flexible roll 31 with which mold release liquid was applied. The ink jet heads 33 and 34 are the same configurations as the ink jet head 13 mentioned above, and many ink jet nozzles are installed in the direction of Y. Moreover, the supply control section 23 and the liquid reservoir 24 are connected to the ink jet head 34, respectively.

[0029] Thus, in the constituted above-mentioned ink jet coater 1, the square shape substrate 10 is first held on the substrate attaching part 12. And it is made to roll, carrying out the pressure welding of the flexible roll 31 to the edge of the near side of the square shape substrate 10 by the roll migration section 32, and making it move in the direction of X. During this rolling, mold release liquid is applied to the peripheral surface of the flexible roll 31 from the ink jet head 33, and resist liquid is applied by the ink jet head 34 on mold release liquid after that. The applied resist liquid is imprinted on the square shape substrate 12 in a pressure-welding location with a square shape substrate. The mold release liquid after an imprint evaporates by the air drying, desiccation by warm air, etc., and is removed. Consequently, the resist film 11 is formed on the square shape substrate 12. Under the present circumstances, since resist liquid is applied to homogeneity on the flexible roll 31 and the flexible roll 31 moves along with the irregularity of the square shape substrate 10, or it, the resist film 11 of uniform thickness can be formed.

[Modification] As shown in drawing 6 , the supply control section 23 may perform jet/cutoff control of resist liquid, and resist film 11a of a predetermined detailed pattern may be formed on the square shape substrate 10. By using the ink jet head 13, formation of such a detailed pattern can also be performed easily. Here, resist film 11a of a detailed pattern can be formed only in the required field on the square shape substrate 10 by carrying out jet/cutoff control of the ink jet nozzle 20. In this case, useless consumption of the resist film can be held down further.

[0030] [Other Example(s)]

(a) It may replace with the ink jet nozzle using a piezo-electric element, and the ink jet nozzle of Bubble Jet or other methods may be used.

(b) It replaces with a square shape substrate and this invention can be applied also to a round shape substrate or the substrate of other configurations.

(c) This invention is not limited to formation of the resist film, and can apply formation of the liquid crystal film, formation of the color filter film, etc. to technical [which forms a thin film on a substrate / at large].

(d) The liquid to apply may be a conductive liquid although thickness becomes

homogeneity more with electric attraction for the liquid to apply to be a dielectric.

[0031]

[Effect of the Invention] According to the thin film deposition system concerning claim 1, since the nozzle of an ink jet method is used, coating liquid can be applied to homogeneity on a square shape substrate only by making a nozzle linearly displaced relatively, without carrying out constant feeding intermittently towards a square shape substrate from the location where the coating liquid which blew off from the nozzle separated from the square shape substrate, and pressing down coating liquid. For this reason, even if curvature and irregularity are in a square shape substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0032] Since the nozzle of an ink-jet method is used, while according to the thin film deposition system concerning invention of claim 2 constant feeding is intermittently carried out towards an elastic roll from the location where the coating liquid which blew off from the nozzle separated from the elastic roll and being able to apply coating liquid to homogeneity at an elastic roll, a roll surface moves along with the curvature and the irregularity of a square shape substrate only by making an elastic roll linearly displaced relatively to a square shape substrate with the elasticity of an elastic roll. For this reason, even if curvature and irregularity are in a square shape substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0033] According to the thin film deposition system concerning invention of claim 3, when coating liquid is applied or imprinted by the square shape substrate, the polarity of coating liquid and a square shape substrate becomes reverse, attraction occurs between a square shape substrate and coating liquid, the coating liquid on a square shape substrate is graduated, and thickness becomes homogeneity more. Since the positive-pressure-ized coating liquid is supplied according to the thin film deposition system concerning invention of claim 4, constant feeding of the coating liquid which blows off from a nozzle is carried out more.

[0034] According to the thin film deposition system concerning invention of claim 5, since jet/cutoff of the coating liquid in each nozzle are controlled, respectively, coating liquid can be applied by the desired pattern on a square shape substrate or an elastic roll, and consumption of coating liquid can be held down more. According to the thin film formation approach concerning invention of claim 6, since the nozzle of an ink jet method is used, coating liquid can be applied to homogeneity on a square shape substrate only by making a nozzle linearly displaced relatively, without carrying out

constant feeding intermittently towards a square shape substrate from the location where the coating liquid which blew off from the nozzle separated from the square shape substrate, and pressing down coating liquid. For this reason, even if curvature and irregularity are in a square shape substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0035] Since the nozzle of an ink-jet method is used, while constant feeding is intermittently carried out towards an elastic roll from the location where the coating liquid which blew off from the nozzle separated from the elastic roll and being able to apply coating liquid to homogeneity at an elastic roll according to the thin film formation approach concerning invention of claim 7, a roll surface moves along with the curvature and the irregularity of a square shape substrate only by making an elastic roll linearly displaced relatively to a square shape substrate with the elasticity of an elastic roll. For this reason, even if curvature and irregularity are in a square shape substrate, along with curvature or irregularity, the thin film of uniform thickness can be formed by easy linear migration control.

[0036] According to the thin film formation approach concerning invention of claim 8, when coating liquid is applied or imprinted by the square shape substrate, the polarity of coating liquid and a square shape substrate becomes reverse, attraction occurs between a square shape substrate and coating liquid, the coating liquid on a square shape substrate is graduated, and thickness becomes homogeneity more. According to the thin film formation approach concerning invention of claim 9, since jet/cutoff of the coating liquid in each nozzle are controlled, respectively, coating liquid can be applied by the desired pattern on a square shape substrate or an elastic roll, and consumption of coating liquid can be held down more.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective view of the ink jet coater by the example 1 of this invention.

[Drawing 2] The cross section of an ink jet head.

[Drawing 3] Drawing equivalent to drawing 2 of a modification.

[Drawing 4] The perspective view of the ink jet coater by the example 2 of this invention.

[Drawing 5] The side-face mimetic diagram.

[Drawing 6] Drawing equivalent to drawing 5 of a modification.

[Description of Notations]

1 Ink Jet Coater

10 Square Shape Substrate

11 11a Resist film

12 Substrate Attaching Part

13, 33, 34 Ink jet head

14 Head Migration Section

16 Electrode

17 Power Source

20 Ink Jet Nozzle

23 Supply Control Section

30 PURICHA Jar

[Translation done.]